

MONTHLY WEATHER REVIEW,

JUNE, 1874.

WAR DEPARTMENT,

Office of the Chief Signal Officer,

DIVISION OF

TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

I.—INTRODUCTORY.

The month of June has been distinguished by a decided excess of temperature, which has been especially marked in the central and western portions of the country, and by a decided excess of rain in the extreme Northwest and Northeast. The crop reports indicate on the average favorable returns, although the local exceptions to this general statement are quite remarkable, and the destruction by insects has, in some sections, particularly southern Minnesota, been quite complete. No severe general storms have been experienced within the United States, but their occurrence has been replaced as usual during June by numerous and severe thunder and lightning and hail storms.

II.—BAROMETRIC PRESSURE.

(1.) *In general.*—The general distribution of barometric pressure during the month will be apparent from the accompanying map, No. 2, from which will be seen that on the average the pressure has been highest on the Gulf and south Atlantic coasts, diminishing gradually as we proceed northward to the St. Lawrence valley and northwestward to Dakota. On the Pacific coast the barometer has as usual stood higher than on the Atlantic coast in similar latitudes; it has averaged 0.17 inch higher at Portland, Oregon than at San Diego. The barometric range during the month has been greatest in the northern portion of the Upper Lake region and somewhat less in Minnesota, Dakota and New England: it has been least in southern Florida and Texas, and on the California coast: the range in Colorado and Wyoming Territories has been about the same as in the lower Mississippi valley.

(2.) *Areas of high barometer.*—The principal areas of high barometer have been: No. I, that which on the 3d and 4th of the month existed off the coast of the Middle and Eastern States, producing south and east winds, with cloudy weather and rain.

No. II. Present in the Gulf States on the 9th.

No. III. Advanced from Upper Canada on the 10th southeastward over New England on the 11th.

No. IV. Passed over the Rocky Mountains on the 10th, having been central in Oregon on the 9th. Its influence was felt southward as far as Texas, while the central area passed eastward over the lower Missouri and Ohio valleys, reaching the middle Atlantic coast on the 14th, and continuing to produce easterly winds, with increasing cloudiness, on that coast on the 15th.

No. V. Was present over the South Atlantic and Eastern Gulf States from the 23d to the 26th.

(3.) *Areas of low barometer.*—The tracks pursued by the areas of low barometer are shown upon the accompanying map, No. 1, from which it will be seen that these have been confined to the northern portion of the country, the average latitude of the whole being somewhat more northerly than the similar average for June, 1873.

No. I. This depression passed from Nebraska on the 2nd of the month into Iowa on the 3d, after which it ceased to be traceable as a definite disturbance, although rainy and cloudy weather were very generally reported over New England.

No. II. Passed from Dakota on the 3d into Canada, and was last recorded north of Lake Superior on the 4th.

No. III. Passed from Nebraska on the 6th eastward over the Lake region and New England, being central in the latter region on the 8th.

No. IV. Passed from Nebraska on the 7th, northeast and eastward over the Lake region and New England, being central in the latter region on the 9th.

No. V. Passed from Nebraska on the 10th, northeastward over the Upper Lake region, Canada and the St. Lawrence valley, reaching the Gulf of St. Lawrence on the 13th.

No. VI. Passed from Kansas on the 14th, northeastward over the Upper Lake region, and thence slowly east and southeastward over Canada and New England, reaching a point south of Halifax on the 18th. The barometric gradients observed in the latter part of the course of this storm-centre were, with one exception, the steepest recorded during the month, although barely amounting to a tenth of an inch for a hundred miles.

No. VII. This storm passed somewhat suddenly from an unknown point one hundred and fifty miles north of Quebec, southeastward over Nova Scotia on the 23d.

No. VIII. Passed from Wyoming Territory on the 23d, eastward over the Upper Lakes, and was lost in Canada on the 25th.

No. IX. Passed from Nebraska on the 27th, northeastward over Lake Superior and thence to the St. Lawrence valley, reaching the Gulf of St. Lawrence on the 30th. This was a very well marked storm-centre. Its barometric gradients on the western side were, on the 28th, three-tenths of an inch to an hundred miles, with corresponding high north and west winds. During its passage eastward over Canada on the 29th, the Middle and Eastern States were visited by numerous local storms, of which some were unusually severe.

(4.) *Local Storms.*—The number of local storms has been apparently greater than usual in the northeastern and northwestern portions of the country, and has been fully up to the average in other sections. Approximately it is estimated that at least five hundred and fifty such storms have been recorded, most of which have been seen at more than two stations. Of those that were especially remarkable, whether in relation to wind, hail, rain or lightning, those may be noted that occurred on the following dates: On the 4th, in Colorado, Missouri, Illinois; 5, Ohio, Michigan; 6, Illinois, New York, Massachusetts; 7, Nebraska, Wisconsin, Illinois, Canada, New York, Michigan and Massa-

chusetts; 8, Nebraska, Iowa, Illinois, Wisconsin, Maryland, Rhode Island, Massachusetts, Canada, Cape Breton; 9, Nebraska, Indian Territory, Pennsylvania, New York, New Jersey, Long Island, Massachusetts; 10, Indiana, South Carolina, Virginia; 11, Indiana and Kingston, West Indies; 13, Louisiana; 14 Missouri, Nebraska; 15, Minnesota; 17, Massachusetts; 20, Tennessee; 21, Havana, West Indies; 23, Texas; 24, Texas, Wisconsin, Virginia; 25, Texas, Indiana, Michigan, Ohio, Canada, Pennsylvania, Virginia; 26, Minnesota, Wisconsin; 28, Missouri, Indiana, Ohio; 29, Indiana, Ohio, Pennsylvania, New York, New Hampshire.

In this series of storms the most remarkable dates are those of the 7th, 8th, 9th, 25th and 29th, on all of which days the local storms were especially prevalent over regions covered by masses of air flowing north and northeastward toward the general barometric depressions then existing in the northern sections of the country. The observer on the summit of Pike's Peak states that the local storms there experienced come from the northwest, west or southwest, and evidently originate over the central portions of the "parks" on the hot afternoons. One such storm approached his station under conditions very favorable for observation, and he noted that while the cloud-bearing currents of air flowed toward the rotating centre from all directions, they had also a decided downward movement, but through the interior funnel masses of smoke-like vapor rapidly ascended. The local storms observed at Pike's Peak belong possibly to the same class with those observed in the Gulf States and the West Indies, and which apparently originate often in the overheating of limited portions of land, rather than in the influence of the wind attending areas of low pressure. The average number of this class of storms as observed at any one station has been: In the Western Gulf States, 6; in the Central and Eastern Gulf, Florida and Key West, 15.

III.—ATMOSPHERIC TEMPERATURE.

(1.) *In general.*—The general distribution of temperature during the month is shown by the isotherms on the accompanying map No. II, on which map, as also on map No. III, the Canadian observations have been carefully combined with those of the United States. From the table of comparative temperatures, it will appear that the month throughout the whole country has been warmer than usual. The range of temperature has been least on the Texas coast and in southern Florida, where it has amounted to about 20 degrees. It has averaged about 30 degrees from Cape May to Wood's Hole. The greatest range has been reported from Colorado and Minnesota, where it has amounted to 50 and 60 degrees. The average temperature on the summit of Mount Washington has been 42.9, or 25° below that of stations near the sea level.

The remarkable contrasts of temperature that are noticed in the winter months on the border of regions over which northerly and southerly winds respectively prevail, are represented during this month by only a single instance—that of the afternoon of the 26th of June—on which occasion a slight barometric depression appears to have been central in northeastern Pennsylvania. South and west winds were at the time prevailing, with a temperature of 90 or more over the South Atlantic and Eastern Gulf States, as also over a portion of West Virginia and Maryland. Southeasterly winds, with a temperature of 68 to 76, prevailed in the southern part of New England, and northerly winds, with a temperature of 56 to 60, prevailed in central New York.

(2.) *Frosts.*—Slight frosts have been very generally reported on the following dates: 1st, Michigan; 2d, New York, Ohio, Pennsylvania and Vermont; 10th, Iowa; 11th, Iowa; 12th, Michigan and Nebraska; 13th, Ohio; 14th, Pennsylvania and Vermont; 15th, Maryland; 16th, Maryland; 24th, Vermont; 25th, Vermont; 27th, Vermont.

IV.—PRECIPITATION.

(1.) *In general.*—The general distribution of rain-fall for the month will be apparent from the accompanying map No. III, from which it will be seen that a remarkable excess has been experienced in Minnesota and the adjacent country, as also in Nova Scotia and New Brunswick. The unequal distribution of the rain-fall, owing to the peculiar local nature of the storms of June, gives rise to the existence of innumerable small regions of from 10 to 100 miles in diameter over which little or no rain has fallen in comparison with that experienced in the country immediately adjoining. Besides these smaller areas, larger ones have existed, as shown on the map, in eastern Texas, southwestern Missouri, the lower Ohio valley, the Middle States, Upper Canada and the lower St. Lawrence valley, in all of which less than two inches of rain have fallen. The rain-fall in Minnesota and Nebraska is generally remarked upon as the heaviest ever known to have occurred. That on the summit of Mt. Washington (13.44inche,) exhibits as usual the great fluctuations of the climate of that spot.

(2.) *Special Droughts.*—The local droughts that have occurred during the month have been specially commented upon as threatening the future harvest in New Jersey, some small sections of New York and Virginia, southern Ohio and Indiana, and eastern Texas.

(3.) *Special Rains.*—Among the rain-falls remarkable for their quantity that have been particularly reported during the month, have been the following: on the 8th, at Sandwich, Illinois; 9th, Plattsmouth, Nebraska; 14th, Fort Gibson, Indian Territory and Plattsmouth, Nebraska; 24th, Indianola, Texas.

(4.) *Number of cloudy days.*—The number of days wholly cloudy as reported from the Signal Service Stations was least in the eastern portion of North Carolina, in the interior of Texas and in Colorado, New Mexico and Kansas, from all of which sections but one day entirely cloudy has been reported. Less than five cloudy days are reported from the Western Gulf coast, the Ohio and lower Mississippi valleys. From five to ten days are reported from the Middle Atlantic States and Iowa. From ten to fifteen cloudy days, and occasionally more, are reported from New England, Lakes Ontario, Huron and Superior, and in Minnesota.

(5.) *Number of rainy days.*—The number of days on which some, even the slightest amount of rain fell at a given station, will, if combined with the quantity of rain that has fallen, give a general indication of the character of the individual rain-storms as to their gentleness or severity. Thus, over those portions of the country that have experienced more than six inches of rain, the average number of rainy days has been—on the Gulf coast, 10; in the Northwest, 18.

The average number of rainy days in districts over which the rain-fall has been from two to four inches, has been—in the Southwest, 6; on the Atlantic coast, 10; in the Middle Atlantic States, 11; and on the Middle Atlantic coast, 9.

From two to five light local showers have generally been reported from those sections of the country in which less than two inches of rain has fallen, except in the Lower Lake region, where from nine to twelve showers and sprinkles have brought only one or two inches of rain.

If the number of rainy or cloudy days is compared with the map of storm-tracks for the month, it will be found that in general the region of greatest rain or cloud frequency on the one hand accompanies the belt of storm-tracks lying, of course, somewhat to the southward thereof; and, on the other hand, these regions cover that portion of the South Atlantic and Eastern Gulf coast over which masses of moist air have been pushed north and west up over the high land in the interior.

V.—RELATIVE HUMIDITY.

The monthly averages of relative humidity, show a very uniform distribution of this element during the month. The lowest average is as usual found on the Western Plains, where the mean for the month, after correction for the altitude of the stations, varies between 25 and 45 per cent. The average humidity for the Ohio valley is from 55 to 60 per cent; that of the South Atlantic coast and Upper Lake region is 75 per cent. The highest average is 88 per cent. on Mt. Washington and at Cape May, and, in general, the humidity at the stations on the immediate Middle Atlantic coast is 10 to 15 per cent higher than at stations an hundred miles in the interior.

VI.—WINDS.

(1.) *In general.*—The prevailing winds of the month are shown by the arrows on map No. 2, from which it appears that southwest winds have prevailed in the central New Jersey coast, central Pennsylvania, Ohio, Illinois and southward to the Gulf; northwest and southwest winds over New England; west and east winds over the Lower Lake region; south and east winds over the Upper Lakes and the Northwest, and southerly winds in Texas, Louisiana and Kansas.

(2.) *Special strong winds.*—The majority of winds above thirty-five or forty miles hourly velocity have been reported from stations north of the 35th parallel, and west of the 85th meridian. The principal exception to this statement has been the velocity of fifty miles reported from Long Branch. The highest velocity on Mt. Washington was 108 miles.

(3.) *Total movement of the air.*—The total movement of the air irrespective of direction has as usual been least at stations in northern Louisiana, and in the Atlantic States lying immediately among or to the eastward of the Blue Ridge. The average of six stations representing these regions, gives for the total movement of the air 2,800 miles. For the immediate South Atlantic coast, four stations, 5,000 miles; for the Middle Atlantic coast, seven stations, 7,400 miles; for the New England coast, four stations, 5,500 miles; for the extreme Northwest, six stations, 7,100 miles; for Pike's Peak, 15,700 miles; for San Francisco, 9,500 miles; for San Diego, 3,900 miles; for Portland, Oregon, 2,800 miles.

VII.—VERIFICATION OF PREDICTIONS.

The critical comparison of the regular tri-daily Probabilities with the weather maps for the succeeding day show that, on the average of the entire country, 86.3 per cent. of the predictions have been verified.

VIII.—NAVIGATION.

The height of water in the rivers is given in the accompanying table, from which it will be seen that no extensively dangerous river floods have occurred. In consequence of heavy rains, local freshets have been reported on the 7th in New York and Connecticut, and on the 12th, in New York.

The June rise in the Missouri has been well marked. The floods that prevailed in the lower Mississippi at the beginning of the month have gradually subsided, allowing the repair of some of the more important crevasses. Observations have been reported referring to a remarkable fluctuation of the waters of Lake Superior, extending about 18 inches above and below the average level.

HEIGHT OF RIVERS ABOVE LOW WATER MARK.

STATIONS.	HIGHEST.		LOWEST.		STATIONS.	HIGHEST.		LOWEST.	
	DATE, JUNE.	HEIGHT. Foot. Inch.	DATE, JUNE.	HEIGHT. Foot. Inch.		DATE, JUNE.	HEIGHT. Foot. Inch.	DATE, JUNE.	HEIGHT. Foot. Inch.
MISSOURI.									
Fort Sully.....	3	9 10	10	7 4	Shreveport.....	1	24 1	30	14 2
Yankton.....	5	14 10	1	13 0	CUMBERLAND.				
Omaha.....	15	12 11	1	5 0	Nashville.....	6	3 6	30	1 4
Plattsmouth.....	14	6 10	1-2	0 1 $\frac{1}{2}$	OHIO.				
St. Joseph.....	17	12 6	3	3 9	Pittsburgh.....	14	6 0	30	1 9
Leavenworth.....	17	10 0	3	1 11	Marietta.....	16	6 10	30	3 6
Kansas City.....	17-19	16 2	4	7 0	Cincinnati.....	21	9 8	30	6 1
Lexington.....	19-20	12 11	4	4 2	Louisville.....	22-24	5 4	14-15	4 3
Brunswick.....	18	13 0	5	2 0	Evansville.....	1	5 5	15	3 10
Boonville.....	15-17	12 10	7	1 6	Paducah.....	1	8 0	30	4 10
Jefferson City.....	19	13 10	7	5 0	ALLEGHENY.				
Hermann.....	19	12 5	7	4 5	Oil City.....	13	3 4	30	0 6
MISSISSIPPI.									
St. Paul.....	22-25	9 8	9-10	5 0	Freeport.....	13	2 0	30	3 2 $\frac{1}{2}$
La Crosse.....	29	7 10	10-11	3 10	YOUGHIOGHENY.				
Le Claire.....	30	4 10	19	3 10	Confluence.....	12	0 0	24-25	0 6 $\frac{1}{2}$
Dubuque.....	30	9 2	20-21	7 8	MONONGAHELA.				
Davenport.....	11	7 0	21-23	4 7	Morgantown.....	11	2 11	27	0 4
Keokuk.....	18	7 9	23-25	5 6	New Geneva.....	12	0 2	27	3 7 $\frac{1}{2}$
Warsaw.....	14	8 9	26-27	5 10	Brownsville.....	12	0 2	27	1 9 $\frac{1}{2}$
St. Louis.....	20	18 5	6-7	11 0					
Cairo.....	22	18 4	10-11	10 10					
Memphis.....	24-25	14 8	13-14	9 4					
Helena.....	1	23 4	12	14 1					
Vicksburg.....	1	42 8	30	22 3					
New Orleans.....	1-2	2 7*	30	6 6*					

* Below high water mark.

† Below bench mark.

IX.—TEMPERATURE OF WATER.

The table on map No. III shows the maximum and minimum temperatures of the water at the stations there given. In reference to this subject, the following general remarks may be made: The average temperature of the water has been within five degrees the same as that of the air, except for the lower Missouri, Lakes Superior, Huron and Champlain and the coast of Maine. The range of temperature has been—In the lower Missouri, 16 degrees; in the upper Mississippi, 21; in the Ohio and tributaries, 20; on the Eastern Gulf coast, 25; on the South Atlantic coast, 8; on the Middle Atlantic coast, 14; in the Lower Lakes, 20, and in the Upper Lakes, from 15 to 30 degrees.

The difference between the maximum water temperature and the maximum air temperature has been greatest in the northern sections of the country, where it has averaged 23 degrees. The average difference for the South Atlantic and Gulf coasts is 11 degrees. In general the minimum water temperatures are higher than those of the air, the only exceptions being at Duluth and Burlington, Vermont. The average difference of these minima decreases gradually from North Carolina, where it is 15, to Maine, where it is one degree. In the waters of the Mississippi and its tributaries this difference varies between 15 and 22 degrees. At Galveston the water has thence been warmer than the air.

X.—ELECTRICAL PHENOMENA.

(1.) *Thunder and Lightning.*—The month of June has been notable in certain sections of the country for the display of atmospheric electricity, the remarkable cases of which have naturally coincided with the dates of severe local storms as given in a preceding section. The first half of the month was in fact remarkable for an almost continuous series of displays of thunder and lightning throughout the West and Northwest. The maximum number of days on which thunder or lightning has been recorded as observed somewhere within the range of vision of the observer, has been 20 to 25 in the South Atlantic and Gulf States and Missouri. It has been observed on from 15 to 20 days in Iowa, Minnesota, Wisconsin, New York and Maine.

(2.) *Auroras.*—The auroral displays, recorded in June, have sometimes evidently stood in an intimate relation to the existing thunder and lightning storms. The auroral streamers of the 7th and 8th appeared brilliant at some few places, but the others were in general very faint. The dates on which they occurred are given in the following list:

1st, In Iowa; 2nd, in Vermont; 3rd, Iowa, Minnesota, New York and Maine; 4th, Wisconsin; 5th, Illinois and Iowa; 6th, Illinois and Maryland; 7th, Colorado, Nebraska, Wisconsin, Iowa, Michigan, Indiana, Illinois, Missouri, Ohio, Tennessee, New York, Virginia, Maryland and Vermont; 8th, Nebraska, Illinois, Ohio, Tennessee, New York, Pennsylvania and Maine; 9th, Vermont; 10th, Vermont; 12th, Wisconsin; 13th, Wisconsin, Vermont and Maine; 14th, Pennsylvania, New Jersey, Connecticut and Vermont; 15th, Connecticut; 17th, Michigan and Maryland; 18th, Pennsylvania; 21st, Vermont; 22nd, Vermont; 23rd, Vermont; 26th, Vermont and Ohio; 28th, Indiana; 30th, Ohio.

XI.—OPTICAL PHENOMENA.

(1.) *Solar Halos*.—The solar halos most extensively observed during the month were the following: On the 3d, Massachusetts, New Hampshire and New York; on the 15th, New Hampshire, New York and Missouri; on the 16th, Iowa, New Hampshire, New York and Massachusetts.

(2.) *Lunar Halos*.—The lunar halos, so far as recorded, appear to have been very local phenomena. Those that occurred between the 22d and 27th were individually observed in one or two States; the others of the month were seen only over small sections of country.

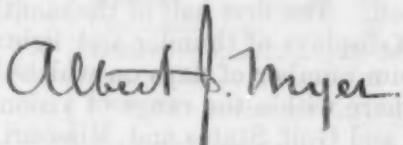
(3.) *Mirage*.—Mirage has been recorded only once during the month, viz: At Oswego on the 10th.

XII.—MISCELLANEOUS.

(1.) *Meteors*.—Notably bright meteors have been rather frequently observed, viz: On the 3d, in Florida; 4th, in Florida; 6th, in North Carolina; 7th, in Indian Territory and Florida; 11th, in Florida; 13th, in North Carolina and Tennessee; 14th, in Florida; 15th, in Florida; 16th, in Tennessee; 18th, in North Carolina and Pennsylvania; 22d, in Florida.

(2.) *Earthquakes*.—The only occurrence of this phenomena that has been reported is the slight shock that was felt on the 18th at Salt Lake City.

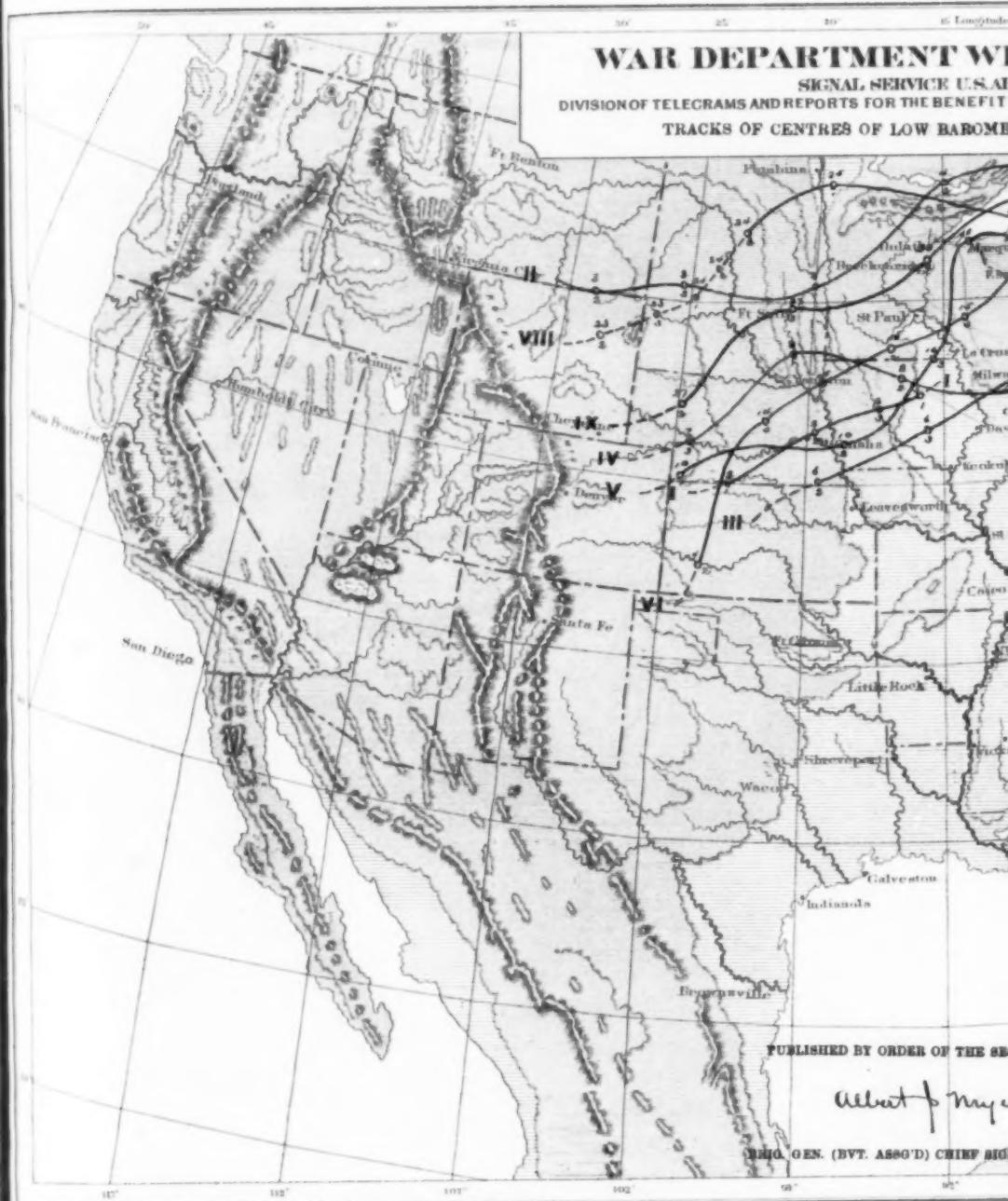
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Brig. Gen. (Bvt. Asstg'l) Chief Signal Officer, U. S. A.

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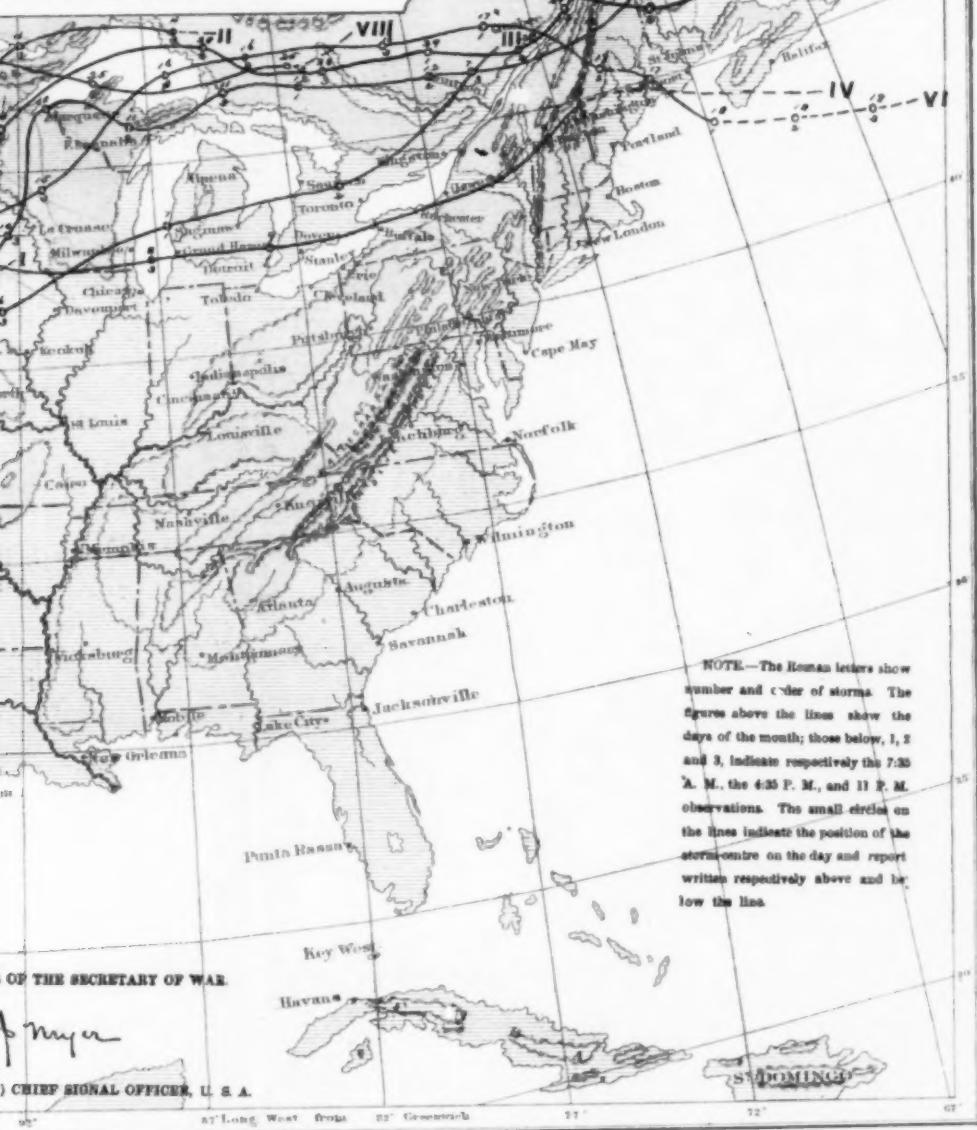




U.S. WEATHER MAP.

U.S. ARMY,
BENEFIT OF COMMERCE AND AGRICULTURE.

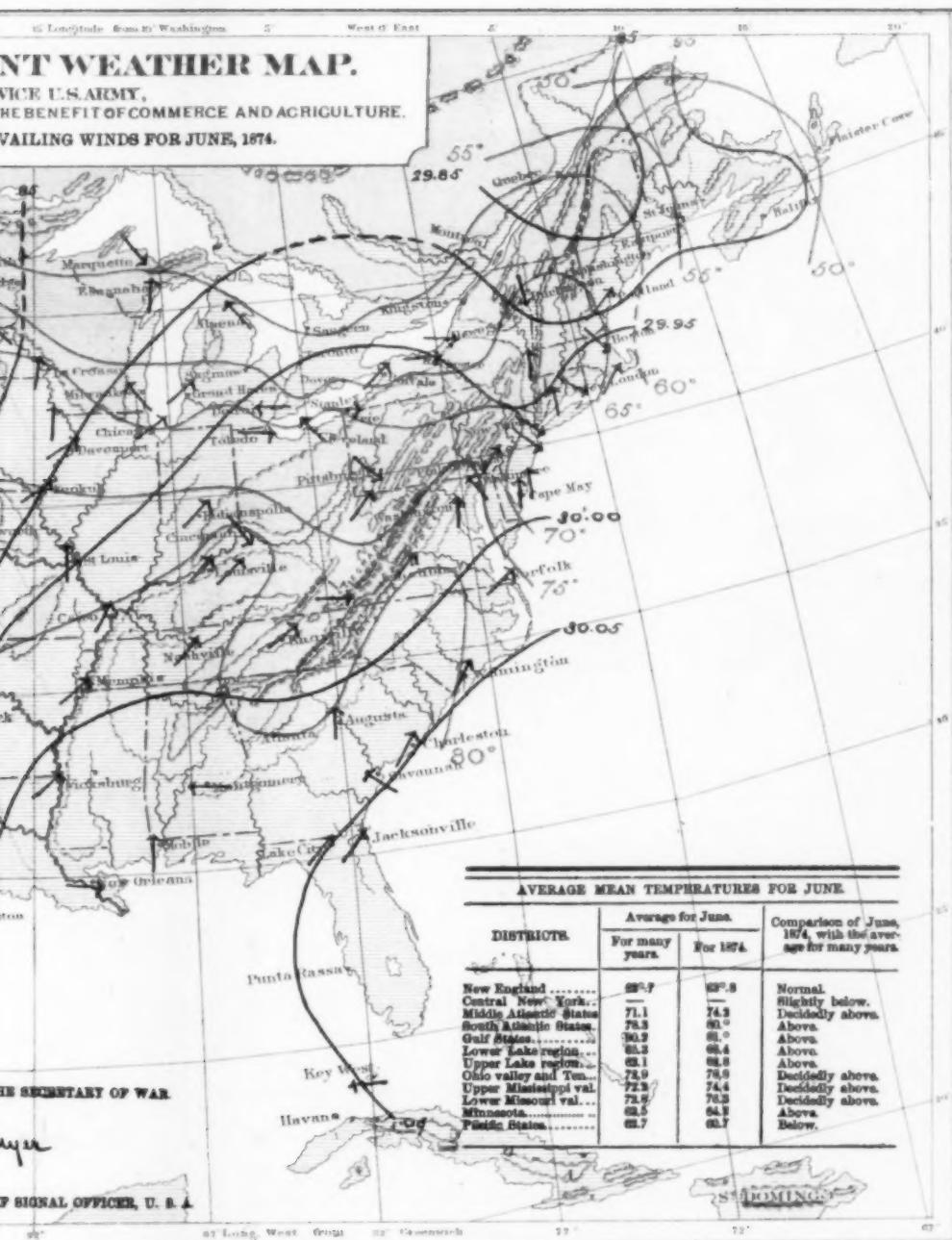
BAROMETER FOR JUNE, 1874.





No. 11.

ENT WEATHER MAP.
FOR THE U.S. ARMY,
THE BENEFIT OF COMMERCE AND AGRICULTURE.
WAILING WINDS FOR JUNE, 1874.

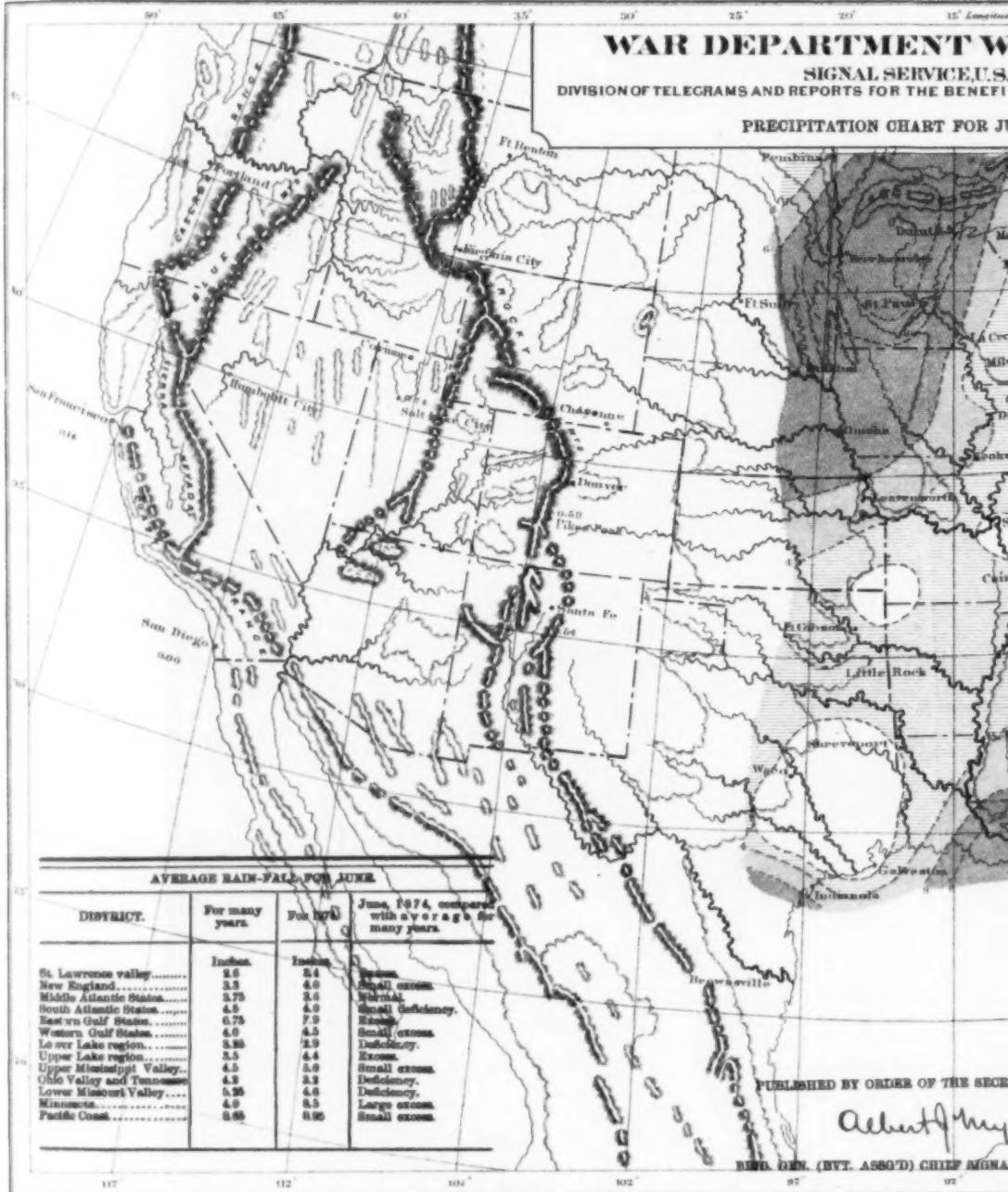


WAR DEPARTMENT W

SIGNAL SERVICE, U.S.

DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT

PRECIPITATION CHART FOR JU



10° Longitude from 10° Washington 8° West of East 6° 4° 2° 20°
COAST WEATHER MAP.
 FOR THE USE OF THE
 U.S. ARMY.
 IN THE
 BENEFIT OF COMMERCE AND AGRICULTURE.

CHART FOR JUNE, 1874.



THE SECRETARY OF WAR

CHIEF SIGNAL OFFICER, U. S. A.